

## APPENDIX C

### Carbon Dioxide Considerations

In waters of high alkalinity it may be necessary to take into account the contribution of dissolved  $\text{CO}_2$  to the total gas pressure. Dissolved  $\text{CO}_2$  is conveniently determined from alkalinity, total filterable residue, pH, and water temperature using a nomograph (Standard Methods, 14th ed. p. 297). The partial pressure exerted by dissolved  $\text{CO}_2$  is calculated from solubility of pure  $\text{CO}_2$  as a function of temperature (Lange's Handbook of Chemistry, 12th Edition 10-4) or from tables giving solubility from air as a function of temperature.

For example, if the water has a  $\text{CO}_2$  alkalinity of 200 mg/l, the pH is 7.5, and the water temperature is  $20^\circ\text{C}$ , the free  $\text{CO}_2$  in solution is about 13 mg/l (a total filterable residue of 265 mg/l was used assuming it to be entirely composed of  $\text{Ca}(\text{HCO}_3)_2$ ). A direct measurement is preferable if available. Since the partial pressure  $\text{CO}_2$  in the atmosphere is about  $3 \times 10^{-4}$  atmospheres (300 ppmv) the solubility of  $\text{CO}_2$  in water in equilibrium with air is about 0.5 mg  $\text{CO}_2$ /l. Thus the partial pressure exerted by 13 mg  $\text{CO}_2$ /l is

$$\frac{13}{0.5} \times 3 \times 10^{-4} \text{ atm} = 7.8 \times 10^{-3} \text{ atms} = 5.93 \text{ torr.}$$

The pressure contribution of  $\text{CO}_2$  to the total gas pressure, if significant, should be subtracted from the sätuatorimeter reading along with that due to  $\text{O}_2$  and water prior to calculation of percent nitrogen saturation.